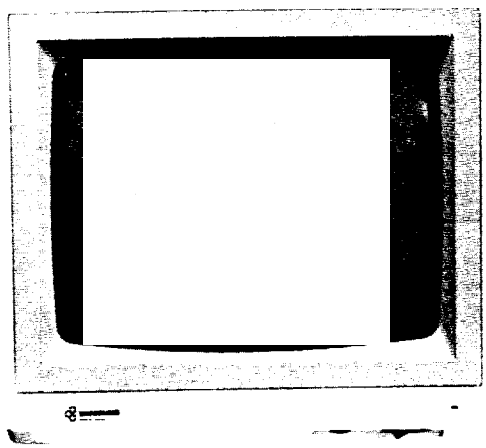
SAMSUNG
Electron Devices

MONOCHROME MONITOR

SERVICE MANUAL

SM-12SS**A6



SPECIFICATIONS

○ Power source	AC 115V±15%, 60Hz AC 220V −240V ± 10%, 50Hz Not switchable, Completely different design
○ Power consumption	35 Watts
○ Input connector	RCA phono jack connector
○ Video signal input	1Vp-p to 2Vp-p Composite Level
○ Picture tube	12" diagonal, 90° deflection 12ZBY31N, Phosphor P 31, PLA Available
○ Scanning frequency	Horizontal ; 15.75KHz Vertical ; 60Hz
○ Active video period	Horizontal ; 44.3us Vertical ; 18.99ms
○ Resolution	Horizontal ; 560 dots Vertical ; 216 lines
○ Active display area	210(H)×160(V)mm
○ Display Charactor	80 characters with 24 lines (7×9 dots)
○ Dimensions	312(W) × 290(V) × 307(D) mm
○ Weight	7.5Kg Approx.

※ **NOTE** : Specification are subject to change without notice

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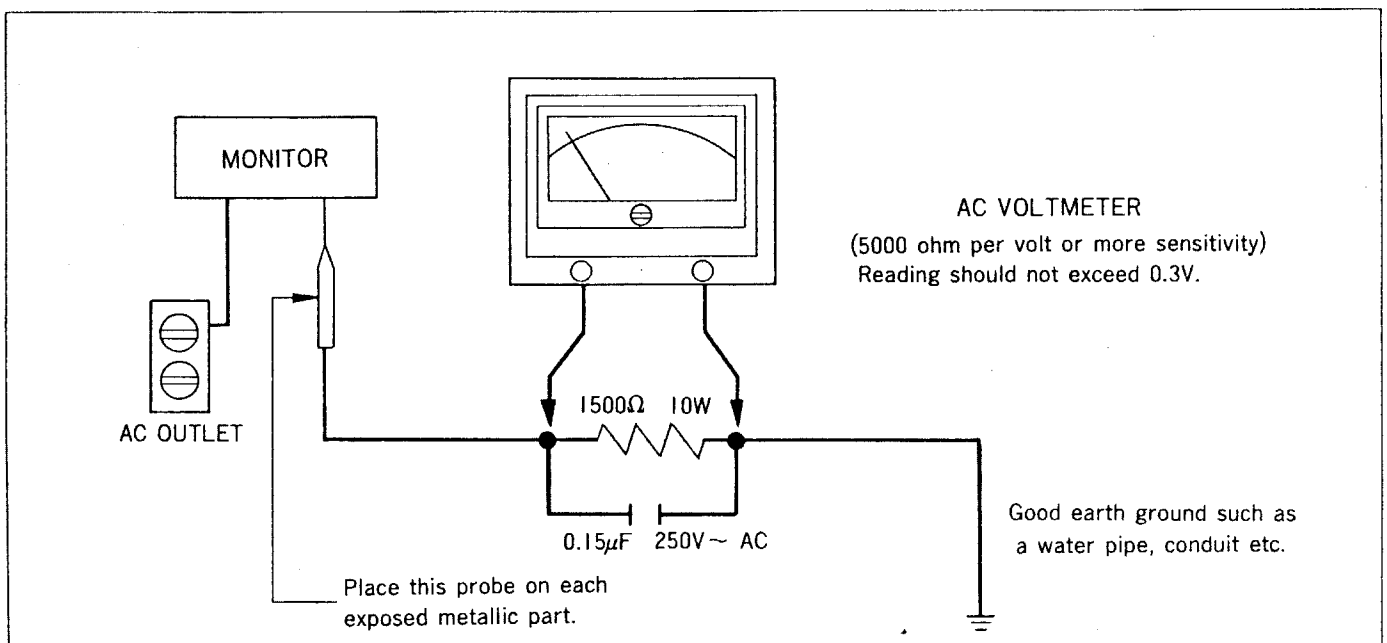
WARNING: Service should not be attempted anyone unfamiliar with the necessary on this unit. The following precautions are necessary during servicing.

1. Some parts such as a picture tube in the unit have special safety-related characteristics for X-RAY radiation protection. For continued safety, the parts replacement should be undertaken referring to item 2 below.
2. Many electrical and mechanical in this unit have special safety-related characteristics for protection against shock hazard, fire hazard and others.
   These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage etc.
   Replacement parts which have these special satety characteristics are identified in this manual and its supplements by shading on the schematic diagram and the parts list.
   Before replacing any of these components, read the parts list in the manual carefully.
3. When replacing a chassis in the cabinet, always be certain that all the protective devices are installed properly, such as insulating covers, barriers, strain relief, etc.
4. Before replacing the back cover of the set, thoroughly inspect inside the cabinet to see that no stray parts or tools have been left inside.
5. Before returning to the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as terminal, screwheads, metal overlays, control shafts, etc.
   To be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly in to a 220V AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner.
   Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15mfd (μF), 250V AC capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time.
   Measure the AC voltage across the combination of 1500 ohm resistor and 0.15mfd (μF) capacitor.
   Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part.
   Voltage measured must not exceed 0.3 volts RMS.
   This corresponds to 0.2mA AC any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



Voltmeter Hook-up for Leakage Current Check

GENERAL INFORMATION

1 MONITOR DESCRIPTION

This 12" CRT display monitor is operated composite mode input.

2 OPERATING CONTROLS

1) External controls
- Front
  Power switch, LED lamp, Contrast.
- Rear
  RCA phono jack input connector, Inlet socket for AC power input,
  Height (V-size), Brightness, V-hold

2) Service controls (Internal controls)
  V-linearity, H-width, H-linearity, Focus, H-hold.
  Horiz. & Vert. Centring magnet.

3 DISPLAY MONITOR ELECTRICAL CHARACTER

1) AC Power Input : 115V±15% 60Hz, 230V± 10% 50Hz. (not switchable completely different design) Power consumption is 35W under normal viewing condition and uses internal fuse protection.

2) Video
- Input : 1Vp-p to 2Vp-p sync negative RS-170 compatible 75 ohms internal termination carbinet-mounted phono jack connection.
- Band Width : 22MHz(-3dB)

3) Horizontal Electrics
- Hold Range : 15.2KHz-16.3KHz free running
- Retrace Time : 9.8us (Includes retrace and delay time)

4) Vertical Electrics
- Hold Range : 47Hz to 63Hz
- Retrace Time : 450μs min(Includes retrace and delay time)

5) Adjustment size range : 210×160 (mm) (Horizontal, vertical from 5% over scan to 5% under scan)

4 MECHANICAL SPECIFICATION

Figure-1 shows the mechanical specification for the CRT display monitor.

5 CRT DISPLAY CHARACTERISTICS

1) Cathode Ray Tube Specification
- Size : 12" diagonal
- Deflection Angle : 90°
- Glass Area : 74 Square inches
- Implosion Protection : Shrinkage band with mounting lug.
- Phosphor : Green (P31) Amber (PLA)
- Display size : 243(H)×175(V) (mm)
- Face : Direct etched
- Anode Voltage : 13.0±1KV

2) Picture Quality
- Resolution : 1100TV line at center, 950TV line at corner at 5 foot-lambert with full "E" character.
- Geometric Distortion : The perimeter of display pattern approaches and ideal rectangle to within ±1.5% of the rectangle height.
- Linearity : Character height or width shall be within 10% of that for any adjacent character and within 20% of that for any character on the screen.
- Display Capability : 80 Characters/Row, 24 Rows.

6 ENVIRONMENTAL SPECIFICATION

The monitor is capable of meeting all performance requirement and operate continously and reliably during and after exposure to any or all of the following environments.

1) Temperature
- Operating : 5°C to 40°C
- Storage : −35°C to 50°C

2) Humidity : 5 to 90 percent (non condensing)

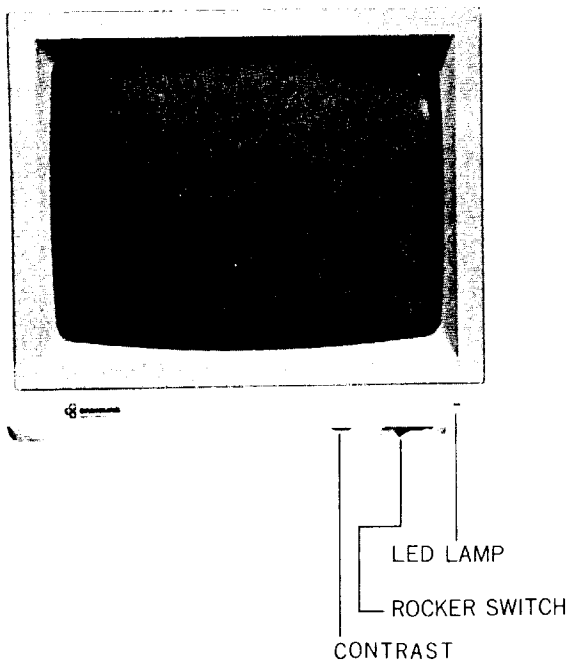
3) Altitude
- Operating : Up to 10,000 FT
- Non Operating : Up to 50,000 FT

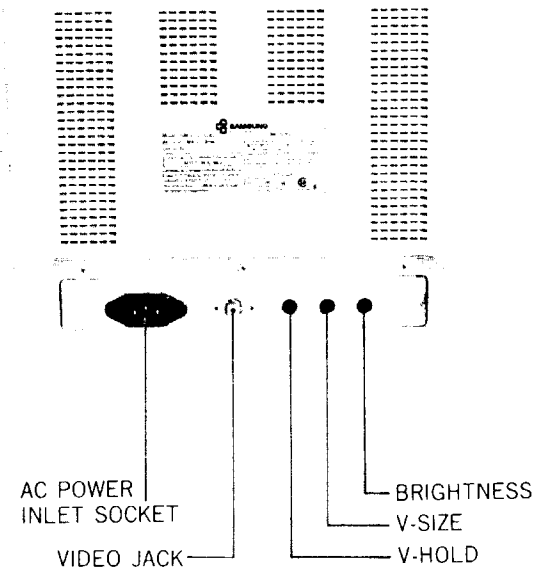
7 X-RADIATION

The CRT display monitor complies with the federal regulation for rediation control as required by the radiation control for health and safety act of 1986 and as implemented by title 21 subchapter J of the code of federal regulation.

1) Weight : Approx 7.5kg

2) Others : All components are capable of meeting UL, CSA, FCC, DHHS, requirement.





MECHANICAL DISASSEMBLIES

CABINET BACK REMOVAL

1. Carefully lay cabinet face down on soft mat.
2. Remove ten(1-10) screws securing the cabinet back and bottom.

CHASSIS REMOVAL

1. First remove cabinet back.
2. Disconnect anode cap, picture socket and wire bands. Then slightly loosen the screw securing the deflection yoke.

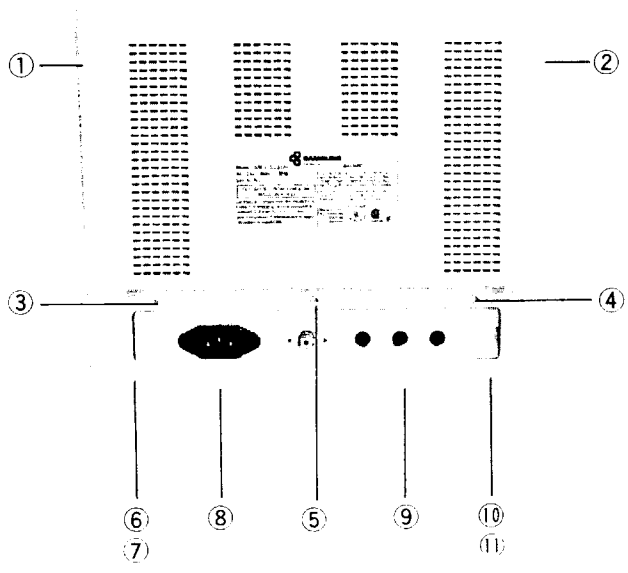


Figure-1

IMPORTANT NOTICE FOR SERVICE PERSONNEL BEFORE SERVICING

PLEASE READ BEFORE ATTEMPTING SERVICE

1. Line voltage must be kept with in ±15% of the rated voltage.
2. Do not discharge, arc, or measure high voltage when high voltage lead is connected to CRT. discharge 2nd anode of CRT only after high voltage lead has been disconnected. do not discharge high voltage lead at any time, damage to transistors may result.
3. While the monitor is in operation, do not attempt to connect or disconnect any wires.
4. Disconnect all power before attempting any repairs.
5. When the power is on, do not attempt to short any portion of the circuit.
   This shorting may cause damage to the transistors in the monitor.

ADJUSTMENT

Apply power and composite input signal(alphanumeric information) to the data dislpay.

CENTERING

1. Loosen the deflection yoke clamp and carefully move the yoke on the neck of the picture tube as far forward as possible.
   Rotate the yoke until the top bottom edges of the raster are straight. Tighten the clamp.
2. Center the raster by rotating the centering rings.

FOCUS

Adjust focus control VR503 for providing the best focus.

HORIZONTAL WIDTH

1. Horizontal width coil to obtain the optimum width for full information.
   If the recommended input signal format is used, the width should be (210mm).
2. When character width variation is observed in character of one row. turn the core of the horizontal linearity control until the character width is uniform.

VERTICAL HEIGHT AND LINEARITY

1. Synchronize the vertical frequency to the information signal by adjusting the vertical hold control VR302.
2. Adjust vertical linearity control VR301 for the best linearity and height control VR303 to obtain the optimum height for full information.
   (If the recommended input signal format used, the height should be 160mm).

SERVICE INFORMATION

ADJUSTMENTS

▼ BRIGHTNESS

Normally, the monitor will be used to display alphanumeric or other black and white information moreover, the video polarity is usually white characters on a black background. The brightness control should be adjusted at a point where the while raster is just extinguished the CRT with then be at its cut off point, and a maximum contrast ratio can be obtained when a video signal is applied fully.

▼ VERTICAL ADJUSTMENTS

There is a slight interaction among the vertical frequency height and linearity controls. A change in the height of the picture may affect linearity.

1) Set the vertical-hold control VR302, near the mechanical center of its rotation.
2) Adjust the vertical linearity control VR301 for best vertical linearity.
3) Adjust the vertical height control VR303 for desired height.
4) Readjust the vertical hold control VR302 until the picture "locks" on vertical sync.
5) Recheck height and linearity, and readjust, if necessary.
6) Slight readjustment of vertical hold contol, VR302 may be required if the picture "Rolls" up or down after a power off/on sequence.

▼ HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination of the DC power supply, horizontal width coil and the horizontal linearity coil.

1) Horizontal Linearity
   When character width variation is observed in characters of one row, turn the core of adjustor so that character width should become uniform.
2) Horizontal Width
   Adjust horizontal width by turning the core of with a plastic hexdrive for the desired width.
3) Readjust horizontal linearity and width coil for proper width.
4) Observe final horizontal linearity and width, and touch up either adjustment if needed the raster should be properly locked and centered when the horizontal drive signal adjustment (Described in steps 1-4 above) have been completed.

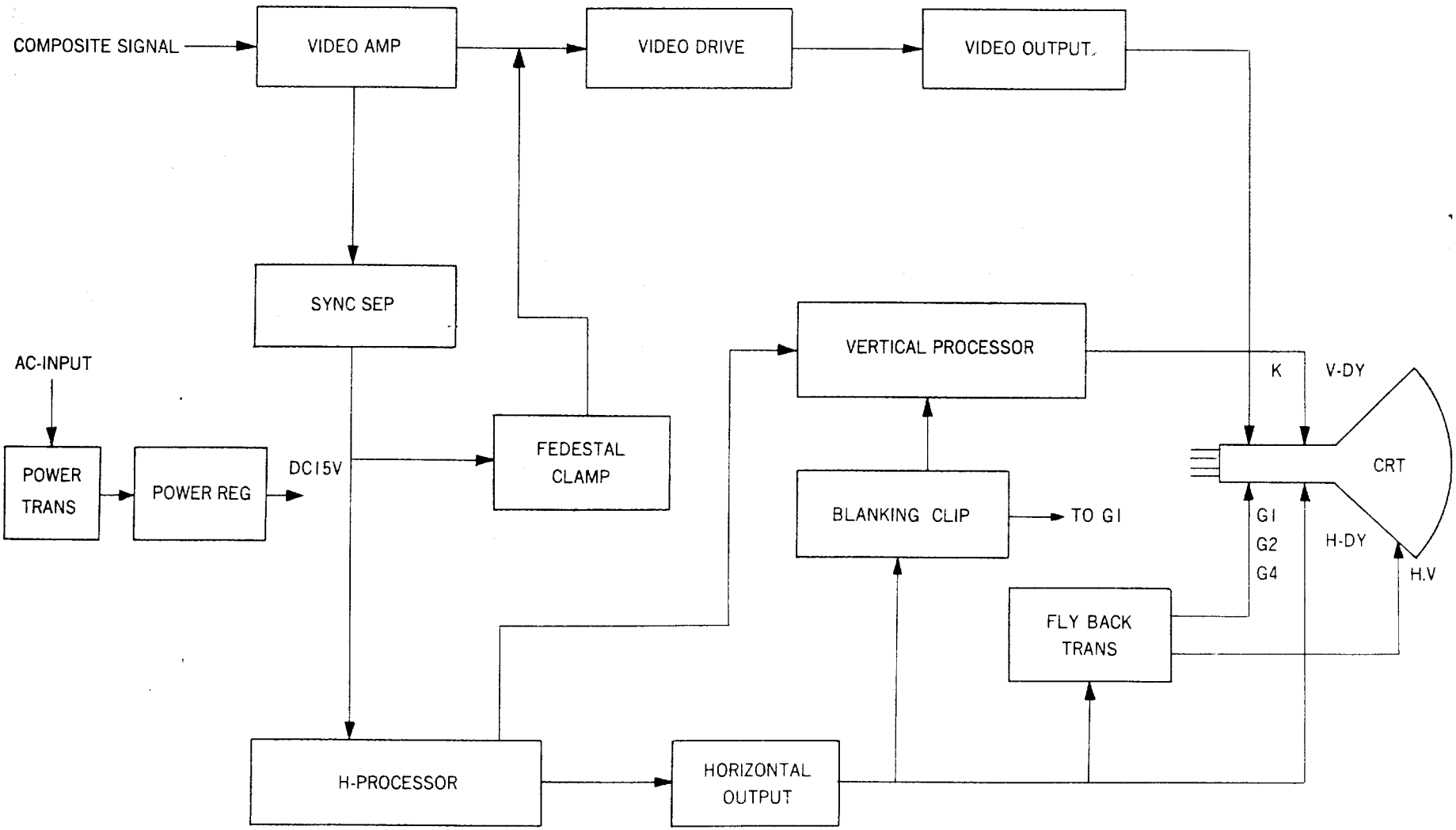
▼ DEFLECTION YOKE ASSEMBLY ADJUSTMENTS

1) Raster Centering
   If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke.
   The ring magnets should not be used to offset the raster from its nominal center position because it would degrade the resolution of the display if the picture is tilted, rotate the entire yoke.
2) Geometric Corrections
   The magnets on the yoke assembly shall be polarized so as to provide adjustment of pin-cushion, barreling and other geometric deformitics by simply rotating the magnets until the desired display is achieved readjust if necessary.

▼ FOCUS ADJUSTMENTS

Although the focus control, VR503 dose not have a large effect on focus because of the CRT gun-assembly construction.
If provides some adjustment for maintaining the best overall display focus.

BLOCK DIAGRAM



THEORY OF OPERATION (CIRCUIT DESCRIPTION)

4-1 VIDEO AMP AND DRIVE AND OUTPUT

Video amplifier consists of four stages. TR201 is 1st amplifier, TR202 is 2nd amplifier. TR401 and TR402 are connected in cascod configuration.
Composite signal which applied to TR201 base is developed across collector load.
This amplified to driver transistor (TR402) via contrast volume VR201.
Finally, drived signal is applied to CRT cathode through output amplifier (TR401). TR401 and TR402 are cascode configuration.
TR402 operates as common emitter configuration and TR401 operates in the common base configuration. This minimizes "THE MILLER EFFECT" input capacitance and defining breakdown parameter for TR401 becomes BV_{CBO} as opposed to BV_{CEO} for the common emitter configuration.

4-2 SYNC SEPARATION

This circuit consist of one stage (TR203).
This circuit separate synchronous signal from the composite signal which composed video and synchronous signal.
This separted synchronous signal is supplied to the IC501.

4-3 VERTICAL PROCESS CIRCUIT

Vertical deflection circuit consist of one stage, IC520 which accomplishes all active vertical sync functions.
Vertical input pulses are differentiated by C301 and R301. The sync input performs several function. It strips away any random noise that may be present on the input line and conditions the vertical pulses for processing.
It also converts the input voltage pulses to current control the internal oscillator.
The Oscillator generates non-symmetrical square wave with a short duty cycle at approximately 60Hz. Components VR302, and R302 and C308, determine the frequency. This square wave signal is applied to a ramp generator whose slope and amplitude is determined by VR303, and R311.
The ramp voltage signal is applied to a buffer stages which isolates the ramp generator from the output stages and reduces any loding on the previous stages. Components R303, VR301, R301, C301 and C302, reshape the ramp voltage to make it extremely linear.
The output signal from the buffer stage is applied to a pre-amp stage. For amplification and then to a power ramp stage which drived the vertical deflection coils display via coupling capacitor C305, R304, R305, R306, R302, R309, C307 and C306 provide AC and DC feedback for the output stage to maintain proper gain and linearity.

4-4 HORIZONTAL OUTPUT AND FLYBACK TRANSFORMER

The horizontal output transistor TR501 is simply a switch is turned on and off at the horizontal scan rate by the driving signal applied to its base.
A sawtooth current through the deflection coil is required to sweep the beam lineary across the CRT screen. This happens when TR501 is turned on and its collector voltage drops to near zero.
And then C516, C517 begins discharging the deflection yoke coil which deflect the beam to the right edge of the CRT. At that time TR501 cuts off and C516, C517 causes to supply current to the deflection coil. However an induced voltage appear across the deflection yoke coil as the magnetic field collapses and an oscillation then occurs the deflection coils and C516, C517.
During the first half cycle of this oscillation the induced voltage is felt across the collector of now cut TR501, C516, C517 and the primary of F.B.T.
This voltage is stepped up by F.B.T. and rectified to produce high voltage that is applied to the 2nd anode at the CRT.
During the second half cycle of the deflection coil C516, C517 oscillation, the voltage on the collector still cut off TR501 becomes negative
At this time damper diode D504 becomes forward bias and begins conduction.
The DC operating voltage for the CRT with the exception of the heater voltage are all obtained by rectifing and filtering of the horizontal flyback pulse.
D507 and C515 rectify and filter the flyback pulse across TR501 to produce a G2 voltage.
This voltage also feeds to the flyback pulses that rectified and filtered by D505 and C519 to produce voltage which is used as the source voltage for GI control raster brightness.
Also, the CRT anode voltage is developed by F.B.T.
This voltage is typically 13.0KV for 12" normal size.

4-5 PEDESTAL CLAMP CIRCUIT

The pedestal clamp circuit is employed in this character display to stabilize the brightness of the picture.
TR204 is switched by means of the pulse produce by time delayed horizontal signal from the TR203 collector.
The base potential of video exciting transistor TR402 is clamped to the emitter potential of TR204, while TR204 is activated the pedestal level of the video signal applied to the base of TR402 is kept constant.

4-6 BLANKING CLIP

Blanking clip circuit consists of two transistor (TR601,

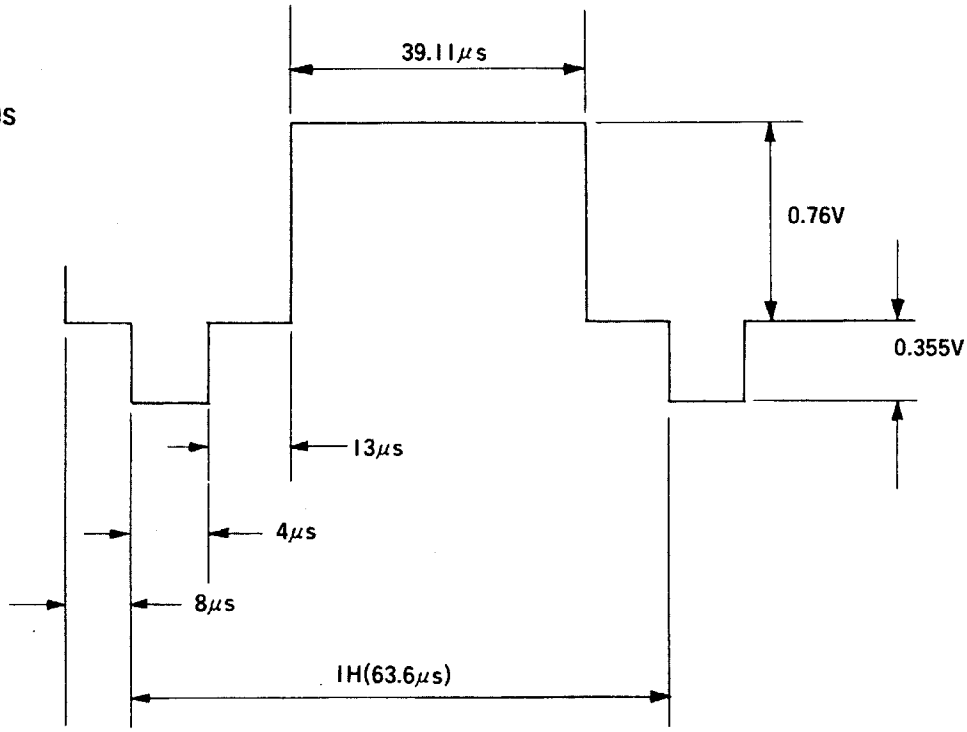
TR602), the vertical signal recived from the vertical output stage is applied to base of TR601 through the R601, C601. Also, the horizontal blanking signal from the horizontal output stage is applied t base of TR602 via the R605 and C603.

These applied signals are appeared at the collector (TR601, TR602) with phase reverse, amplification and composition. And than, these signal are applied to brightness grid of CRT through C524.

SIGNAL TIMING CHART

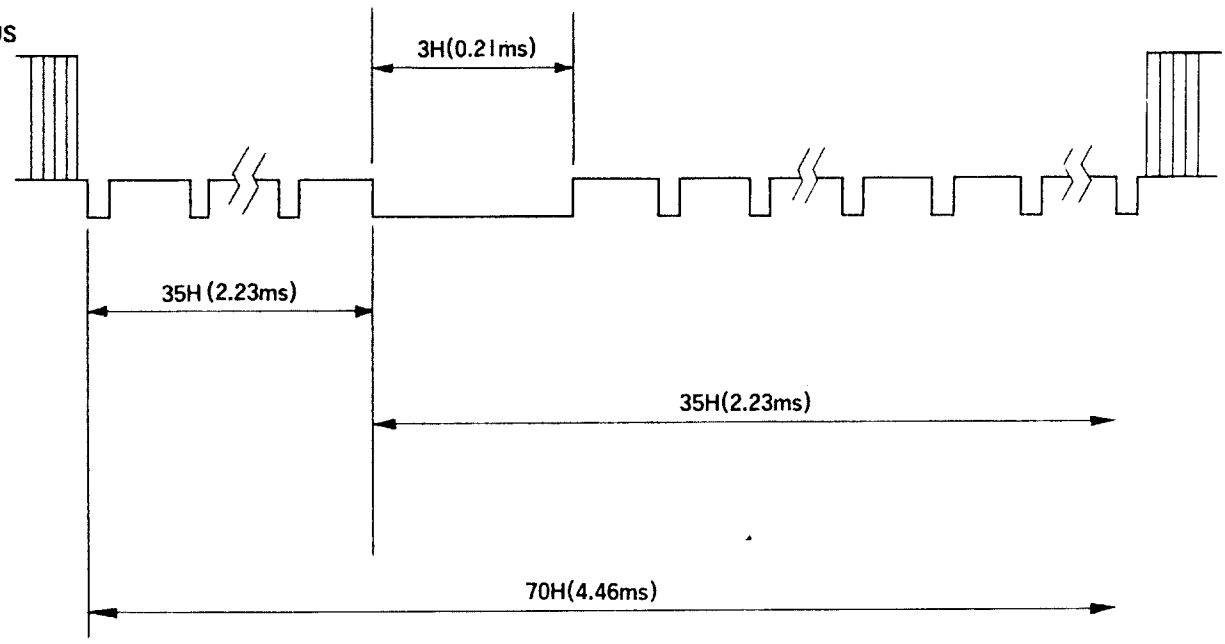
(COMPOSITE MODE)

HORIZONTAL
SYNCHRONOUS
INTERVAL

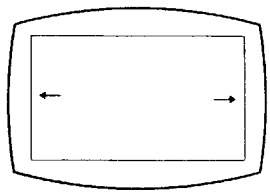
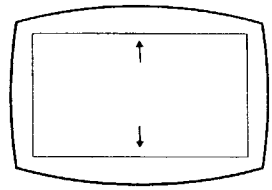
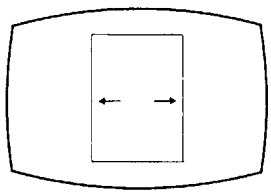
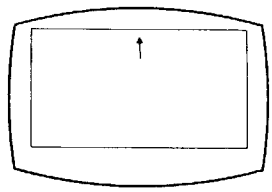
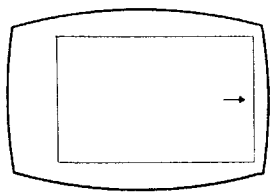
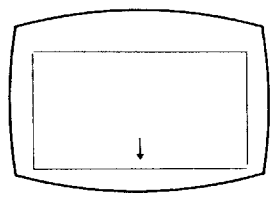
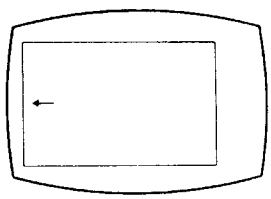
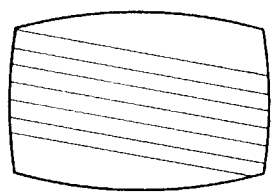
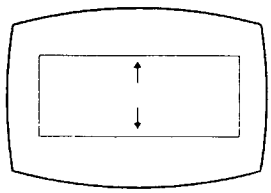
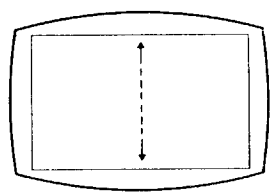


VERTICAL
SYNCHRONOUS
INTERVAL

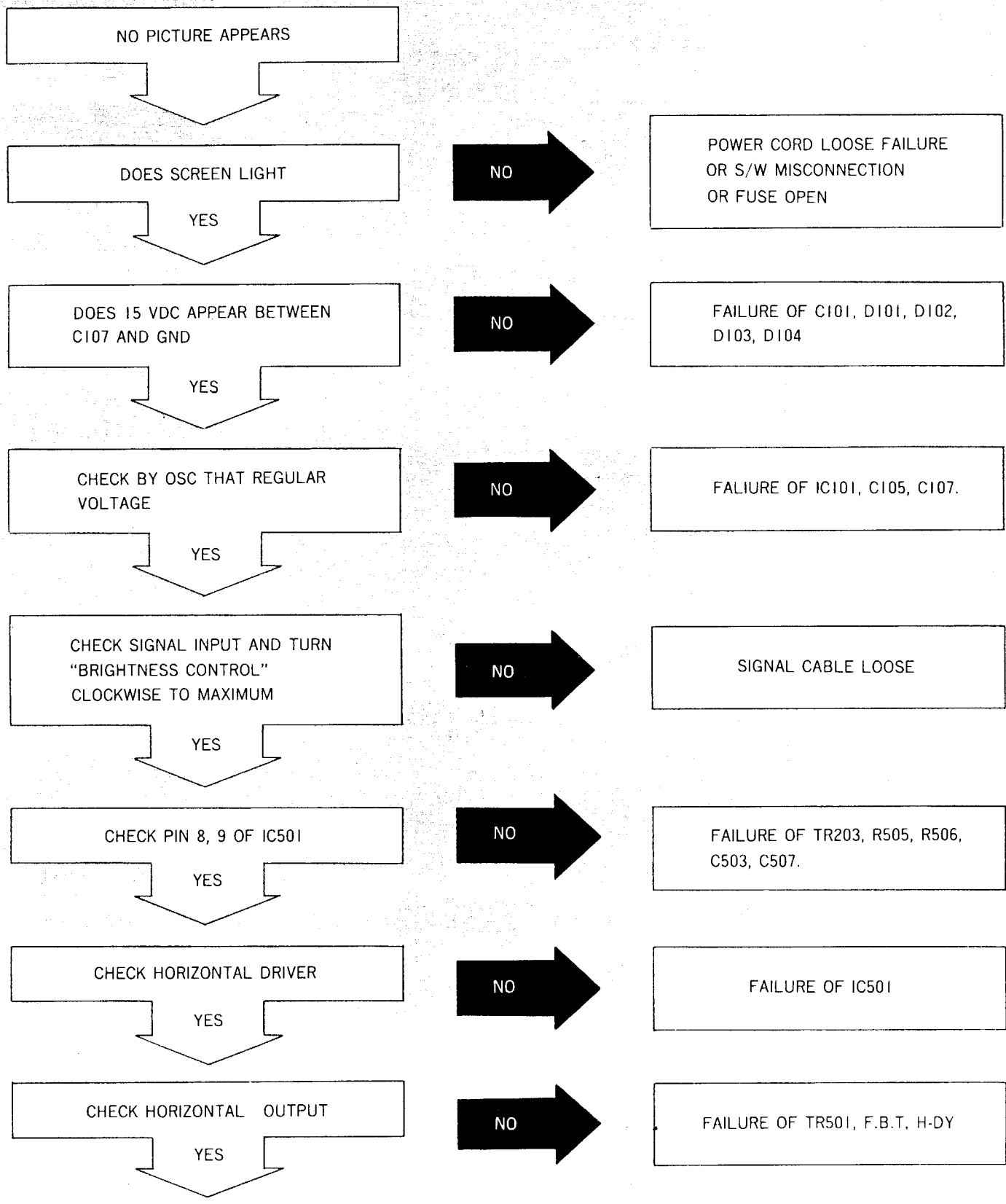
VIDEO

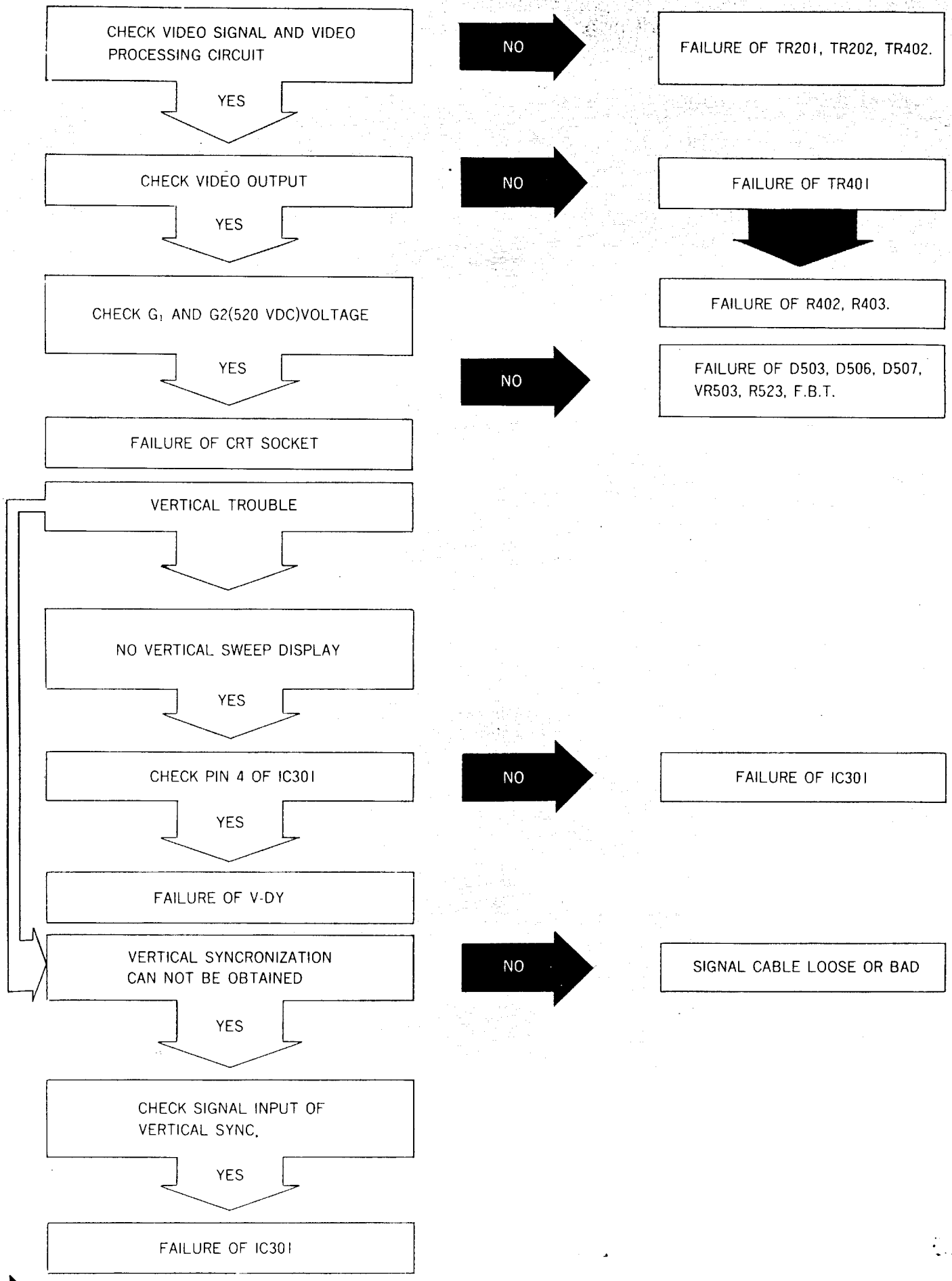


WHEN SIGNALS OTHERS THEN THE RECOMMENDED SIGNAL ARE RECEIVED

PHENOMENON	CAUSE	PHENOMENON	CAUSE
Picture width too wide. 	Data display period is more than 39.11μSec.	Height of picture too much extended. 	Vertical flyback period is less than 7.8ms
Picture width too narrow. 	Data display period is less than 39.11μSec.	picture deviates up ward. 	Picture until that vertical sync signal period or more.
Picture deviates to the right 	Value of front porch is more than 8μSec or value of back porch is less than 13μSec.	Picture deviates down ward. 	Picture until that vertical sync signal period or less.
Picture deviates to the left. 	Value of front porch is less than 8μS, or value of back porch is more than 13μSec.	Picture becomes lateral stripes. 	Horizontal sync. frequency is not set to 15.75KHz
Height of picture too shortened. 	Vertical flyback period is more than 7.6ms	Picture flows vertically (upward and down ward) 	Vertical sync. frequency is not set to 50Hz

TROUBLE SHOOTING INFORMATION CHART




CHECK VIDEO SIGNAL AND VIDEO PROCESSING CIRCUIT
NO
FAILURE OF TR201, TR202, TR402.
YES
CHECK VIDEO OUTPUT
NO
FAILURE OF TR401
YES
FAILURE OF R402, R403.
CHECK G1 AND G2(520 VDC)VOLTAGE
YES
NO
FAILURE OF D503, D506, D507, VR503, R523, F.B.T.
FAILURE OF CRT SOCKET
VERTICAL TROUBLE
NO VERTICAL SWEEP DISPLAY
YES
CHECK PIN 4 OF IC301
NO
FAILURE OF IC301
YES
FAILURE OF V-DY
VERTICAL SYNCRONIZATION CAN NOT BE OBTAINED
NO
SIGNAL CABLE LOOSE OR BAD
YES
CHECK SIGNAL INPUT OF VERTICAL SYNC.
YES
FAILURE OF IC301

TROUBLE SHOOTING FOR RESPECTIVE SYMPTOMS

▼ NO RASTER

1) Turn the internal brightness control clockwise fully :
If raster appears : Good
If raster does not appear : No good to next check item.

2) Is CRT heater on?
It is not on : Check CRT-Heater voltage, power supply circuit and CRT socket for normality.
It is On : Proceed to next check item.

3) Check high voltage by high-voltage voltmeter.
High voltage is not obtained :
Check of flyback transformer T501.
Check the collector pulse of Q501, Check of pin 2 and pin 8 (input pin) of IC501, check of pin 9 of IC301.
High voltage is obtained : to next check item.

- Check respective CRT electrode voltage for normality with a multi-tester.
  -G1 : −100V+50V
  -G2 : 500V-600V
  -G4 : −100V-500V
  -K : 40V-55V

  -When voltage of G1 and G_4 are not obtained :
  Check of D503, D504, D505, D506, D507, VR503, R523, R409, R410, E401, E402 and F.B.T.

  -Voltage of G1 is not obtained :
  Check of D503, C524, C522, VR504, R407, R525, E404 and F.B.T.

  -Voltage of K is not obtained :
  Check of D503, D506, C522, C402, C403, R403, R402.

  Voltage of G_2, G_4 and K are normal :
  CRT is faulty, replace CRT.

- Only one raster line appears in horizontal direction : Check of deflection yoke vertical coil When deflection yoke vertical coil is shorted or opened. deflection yoke is faulty and should be replaced.

- Only one raster line appears in vertical direction : Check for wire broken in deflection yoke horizontal coil, H-Dy, width, lin open, TR501 is short or open.

- Raster is deformed abnormally : Rare shorting of deflection yoke coil, replace deflection yoke.

- Excessive noise in raster :
  Check by measurement that ripples of power supply is less than 50mV p-p when ripples are normal, check to determine whether is any such source that causes alternating magnetic field near the unit.

- When power is turned off spot remains : Check C402, C511 and CRT for deterioration.

- Brightness range is abnormal :
  Deterioration of C511, or CRT, check of G_2 voltage, check of heater voltage.
  Check of TR401, TR402 and E401 and C515.

- Raster size is small and picture is abnormally bright (high voltage is abnormally high) check of C506 or FBT.

- Vertical synchronization is not achieved.
  Check of IC301, VR302.

- Raster position is deviate relative to CRT face :
  Turn deflection yoke centering magnet so that raster should be positioned at center.

- Picture or characters do not appear, contrast is unachievable :
  Check of C202, TR201, TR202, VR201, C205, TR401, TR402 and associated components.
  Check of input signal.
  Check of CRT.

- Picture or characters are displayed but inclined :
  Untighten clamp screw on deflection yoke. pectify the inclination by turning the entire deflection yoke.

- Fine lines(noise) appear in the picture and characters shiver :
  Check high-voltage portion for leakage.
  Check connectors for complete contact.
  Check FBT for wire breakdown.

- It takes long for picture to appear (more than 15 seconds) service life of CRT has reached replace CRT.

- Sync noise not replated with input data appears in picture :
  Check grounding wire for poor contact video grounding for incompleteness input signal for normality and power supply return for incompleteness.

- Picture appear and disappear alternately :
  Check of input signal.
  Check of video circuit for poor soldering.
  Check of CRT socket.

- Horizontal linearity is not achieved :
  Check of IC301, VR301.

- Vertical linearity is not achieved :
  Check of IC301, VR301.
- Focusing is not achievable :
  Check of voltage G_2 and G_4. Readjustment of VR503.
  Check of high voltage.
  Check of D503.

  When all above items are normal, CRT is faulty and should be replaced.

VOLTAGE CHART (1)

1. TRANSISTOR

Measured with high impedance V.T.V.M or circuit tester under line voltage 120V, voltage reading may very ±10%

TR Lo/No.	TR Type	Function	Operating Condition	Base	Emitter	Collector	Note on Measurement
TR201	C1815	Video Amp	Non signal 1.12Vp-p Signal	3.3V 3.3V	2.66V 2.66V	10.69V 10.69V	V.T.V.M
TR202	A1015	Video Amp Drive	Non signal 1.12Vp-p Signal	10.68V 10.68V	11.35V 11.35V	5.83V 5.84V	〃
TR401	BF258	Video Output	Non signal 1.12Vp-p Signal	6.85V 6.83V	6.3V 6.3V	47.6V 40V	〃
TR402	2N2222A	Video Drive	Non signal 1.12Vp-p Signal	0.73V 1.3V	0.12V 0.67V	6.3V 6.3V	〃
TR501	BU806	Horizontal Output	Non signal 1.12Vp-p Signal	−0.21V −0.21V	12V 11.7V	20.5V 20.5V	〃
TR601	C1815	Blanking Clip	Non signal 1.12Vp-p Signal	−1.9V −1.9V	1.9mV 1.9mV	36.8V 35.6V	〃
TR601	〃	〃	〃	−2.85V −2.84V	〃	〃	〃

VOLTAGE CHART (2)

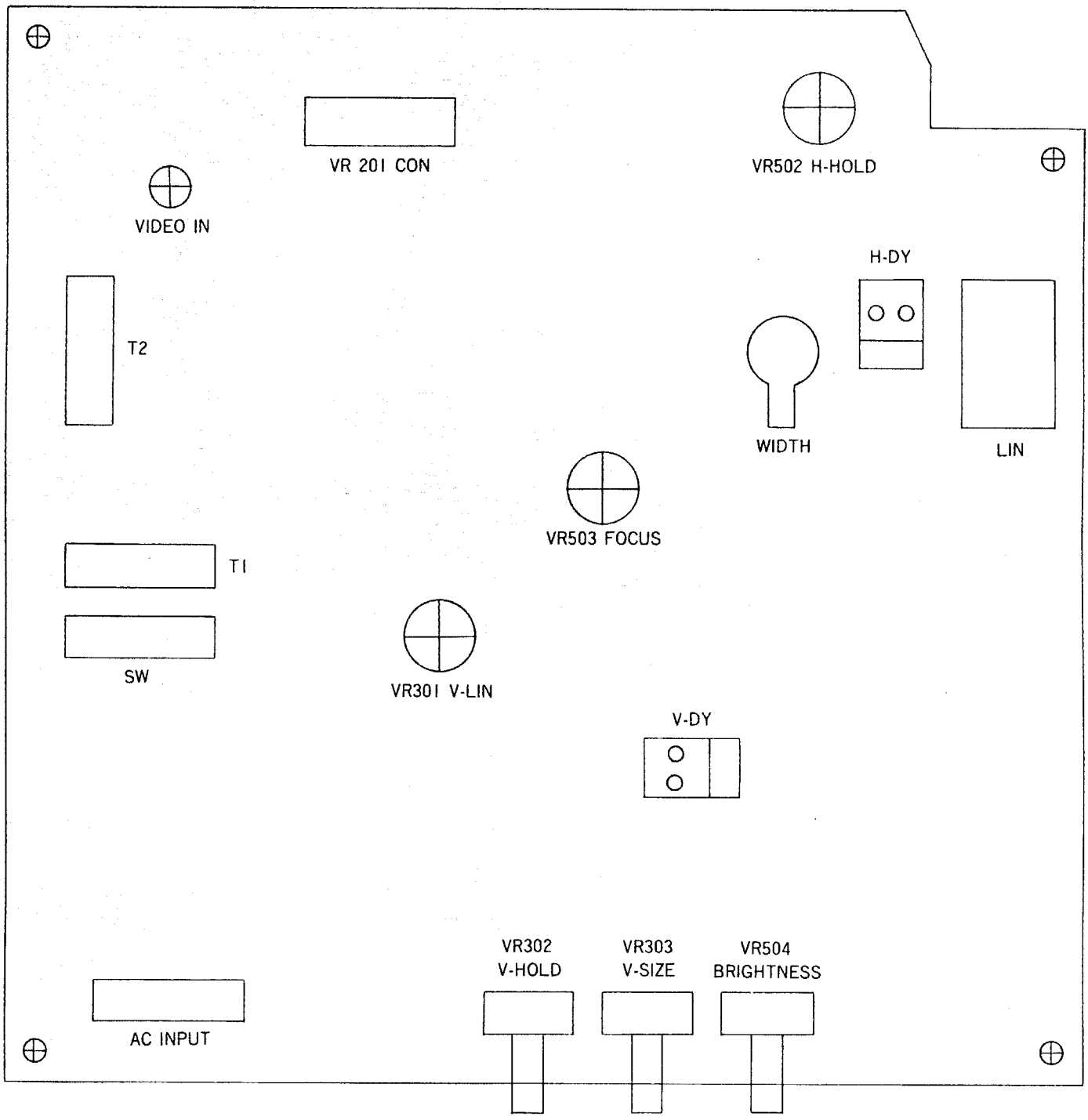
1. IC

Measured with high impedance V.T.V.M or circuit tester under line voltage 120V, voltage reading may very ±10%

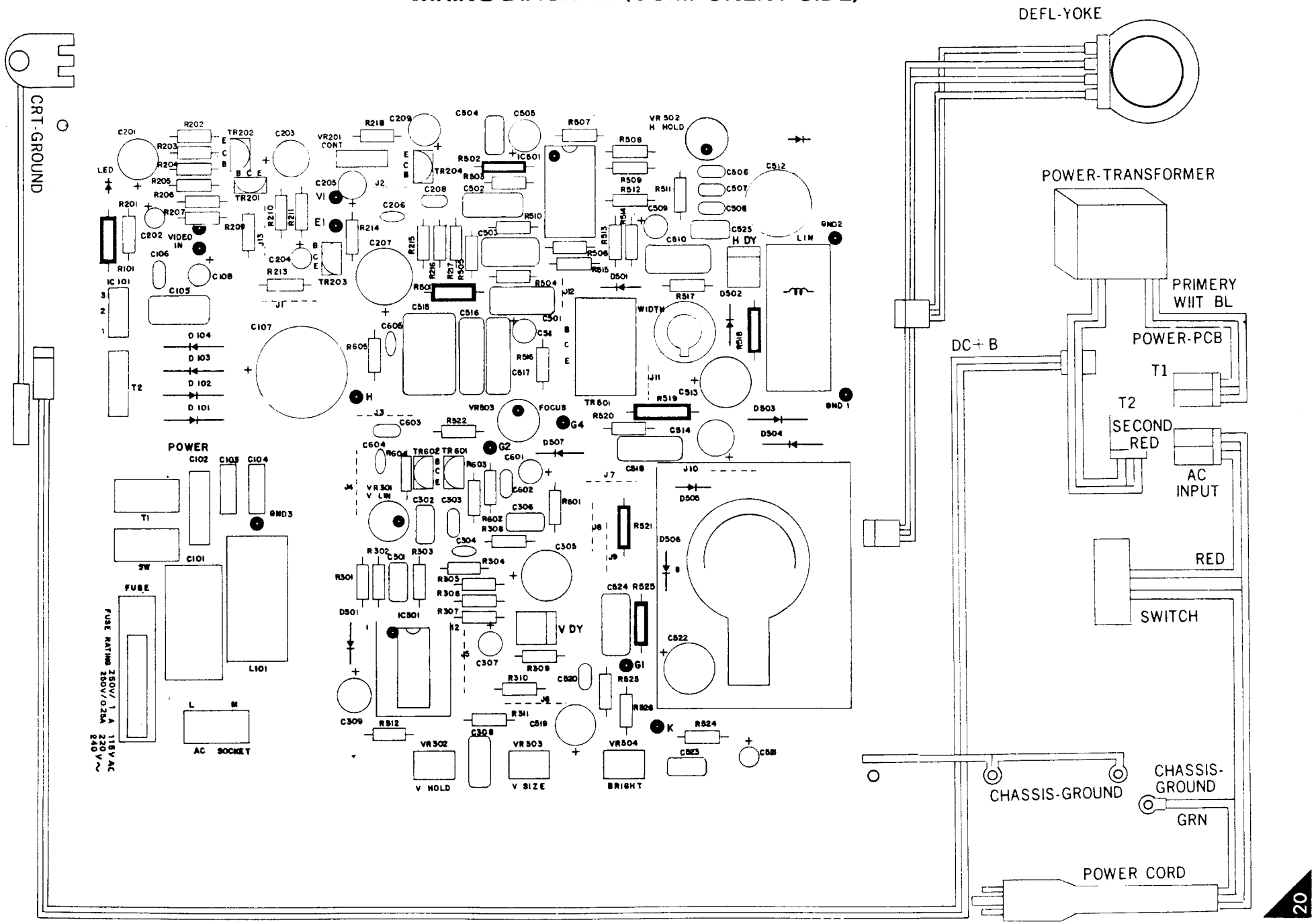
Pin No	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101 L78S15CV VIDEO DRIVE														
No Signal	20.5 V	0 V	15.1 V											
1.12Vp-p Signal	〃	〃	〃											
IC301 TDA 117ON VERTICAL OSC/PRIVER OUTPUT														
No Signal	6.0 V	15.13 V	0.27 V	6.3 V	14.7 V	6.64 V	6.74V	2.61 mV	3.12 V	2.1 V	0.685 V	5.56 V		
1.12Vp-p Signal	5.85 V	15.2 V	0.27 V	6.4 V	14.7 V	6.65 V	6.75 V	3.73 mV	2.98 V	2.12 V	0.72 V	5.4 V		
IC301 TDA 118ON HORIZONTAL OUTPUT														
No Signal	11.9 V	5.5 V	4.38 mV	11.7 V	8.38 V	1.81 V	1.28 V	1.31 V	1.38 V	11.8 V	7.87 V	2.96 V	2.87 V	6.77 V
1.12Vp-p Signal	11.9 V	5.52 V	4.47 mV	11.7 V	8.38 V	1.95 V	1.25 V	0.17 mV	0.25 V	0.28 V	7.72 V	2.9 V	20.4 V	6.74 V

Pin No	15	16
IC501		
No Signal	2.87 V	4.1 mV

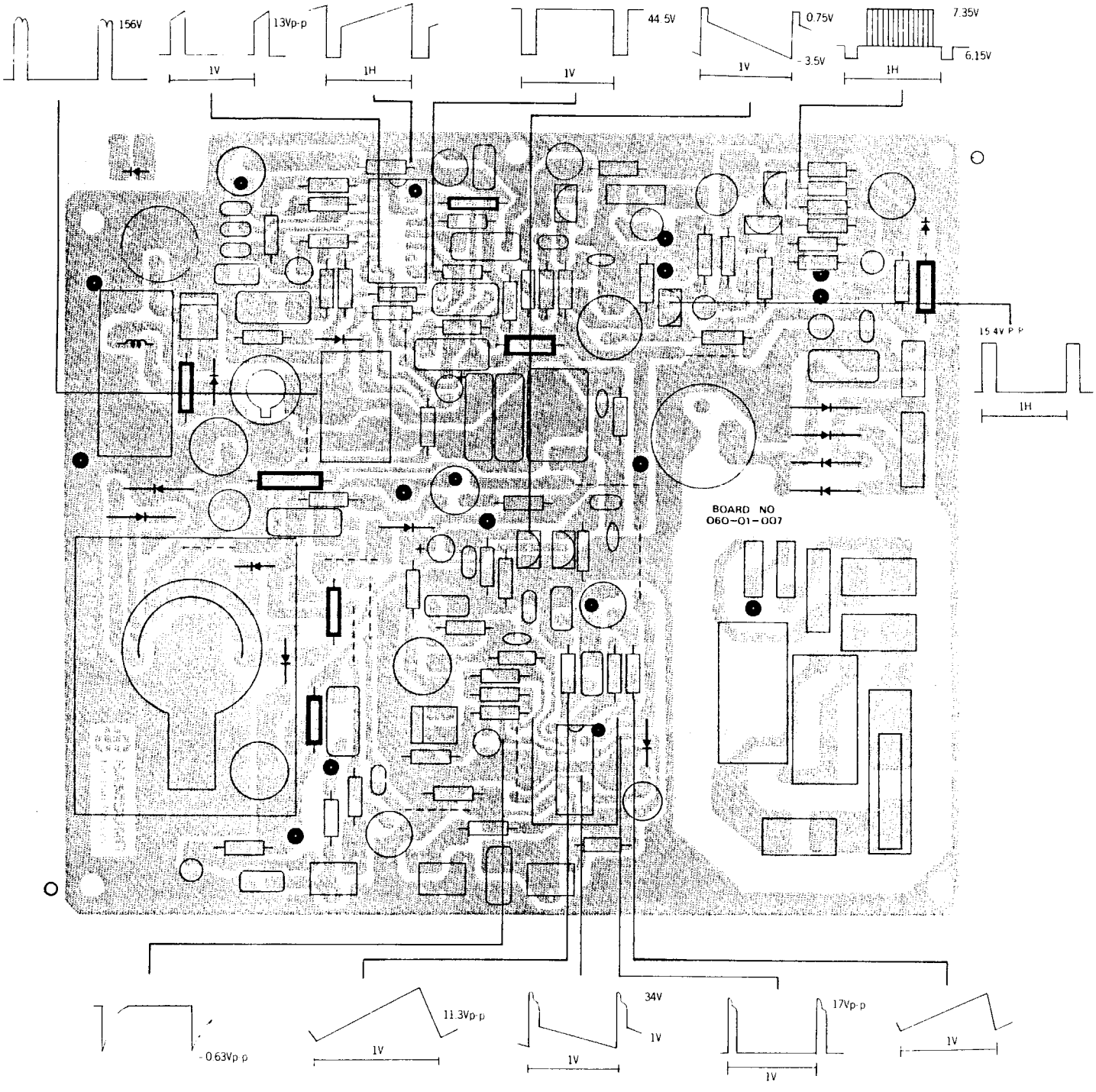
ADJUSTER AND CONNECTOR FOR MAIN PC BOARD.

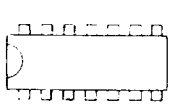


WIRING DIAGRAM (COMPONENT SIDE)

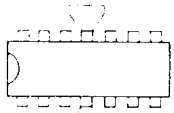


PC BOARD ASSEMBLY (SOLDER SIDE)

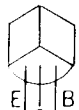




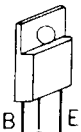
74LS06



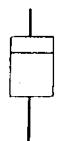
TDA1170



KSC1008

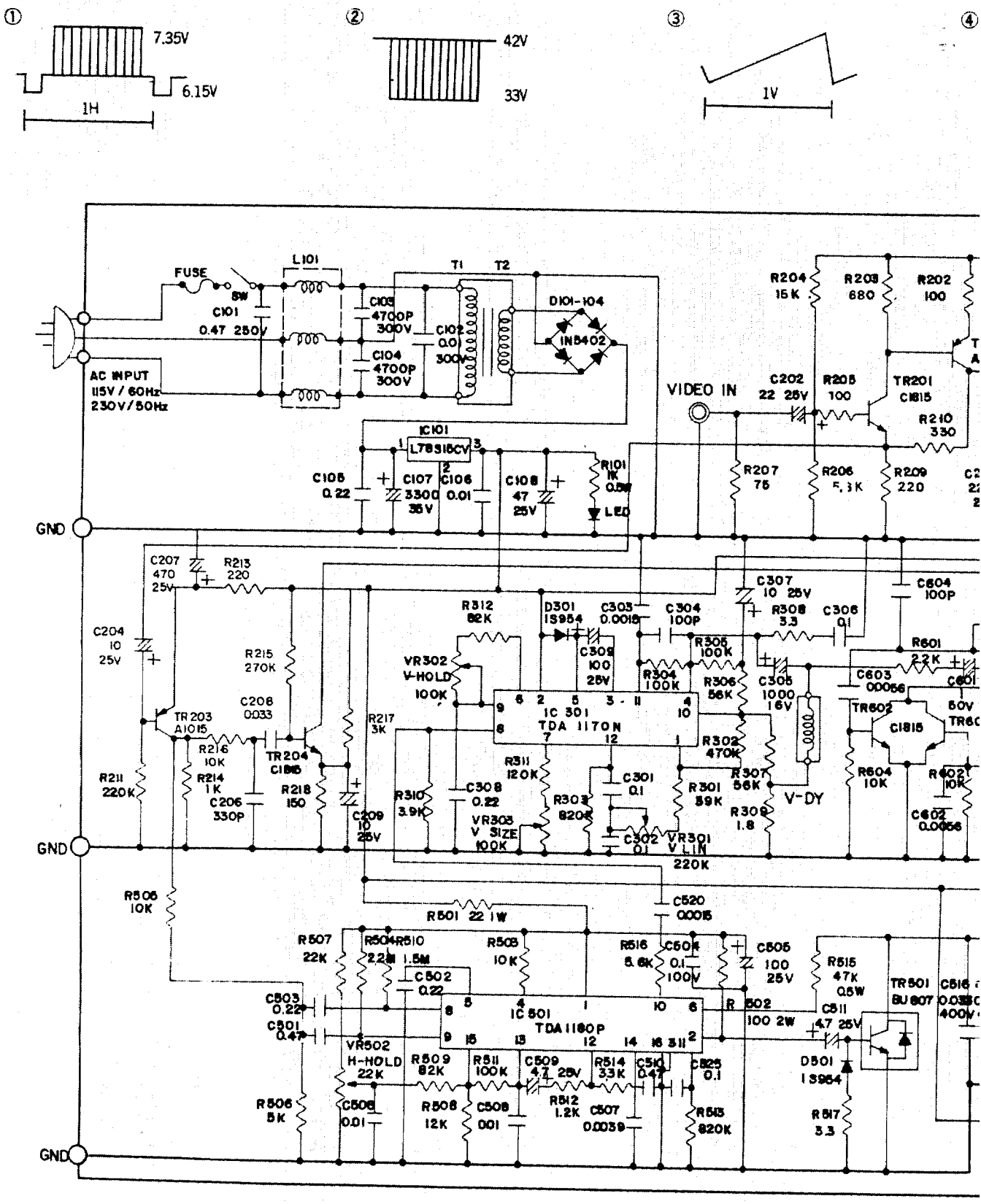


BU806

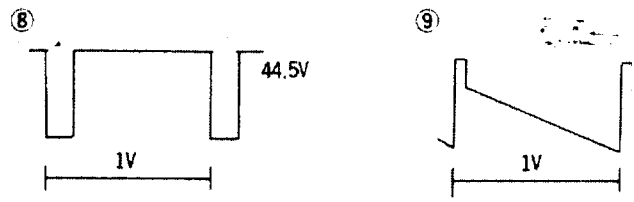


1N5402
1N4148
1N4002

SCHEMATIC DIA

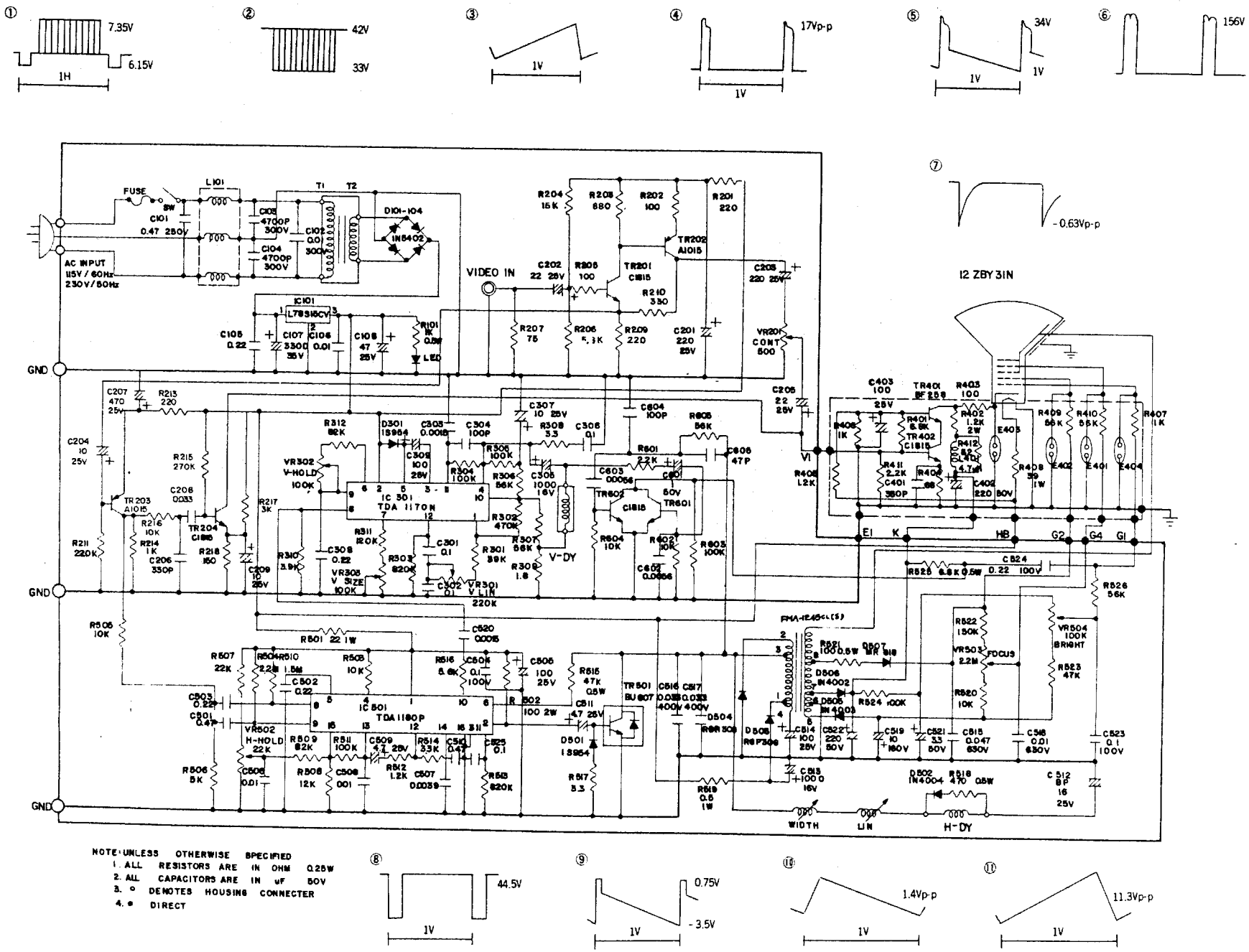


NOTE: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHM 0.25W
2. ALL CAPACITORS ARE IN uF 50V
3. ○ DENOTES HOUSING CONNECTER
4. ● DIRECT

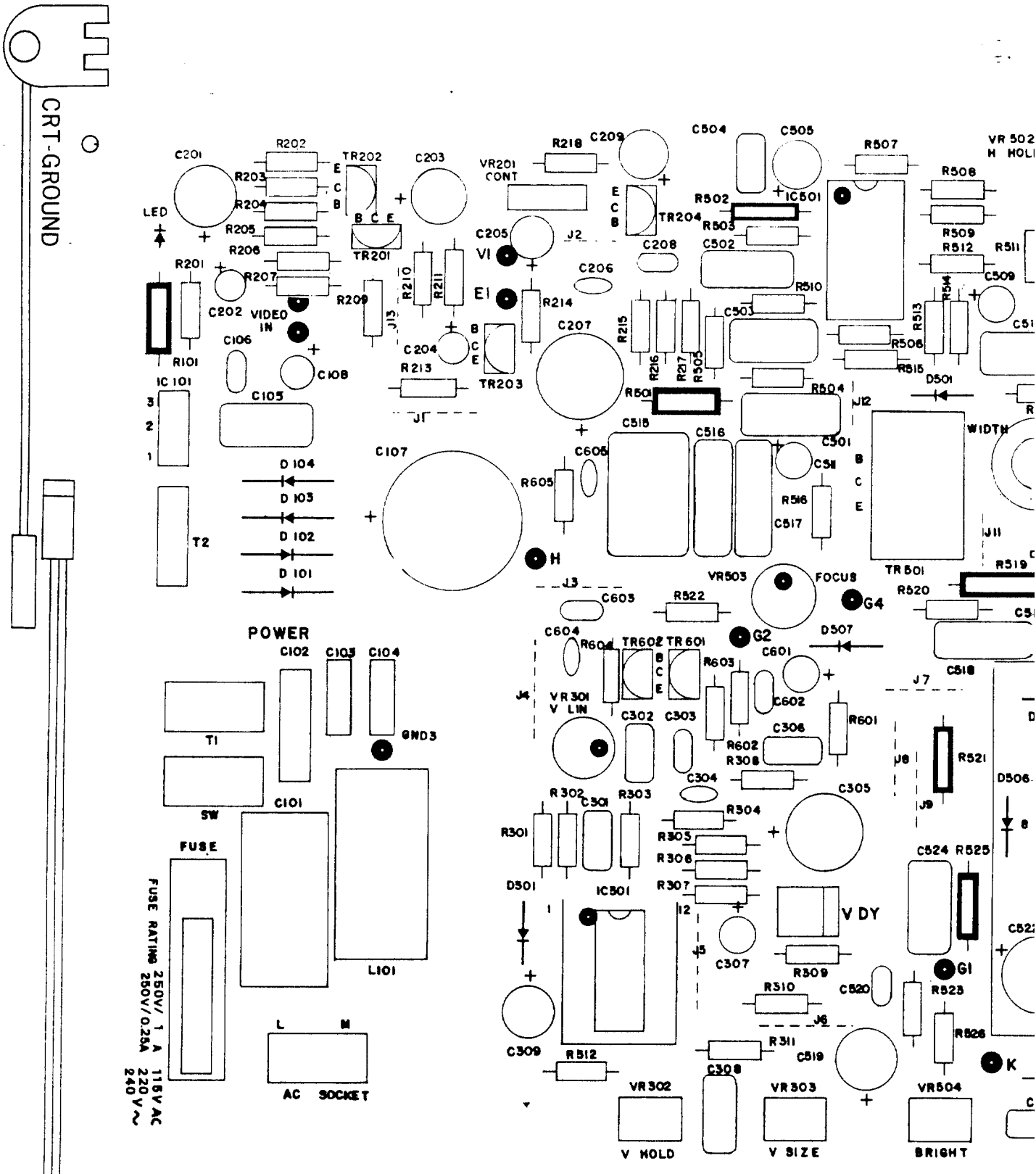


ATIC DIAGRAM

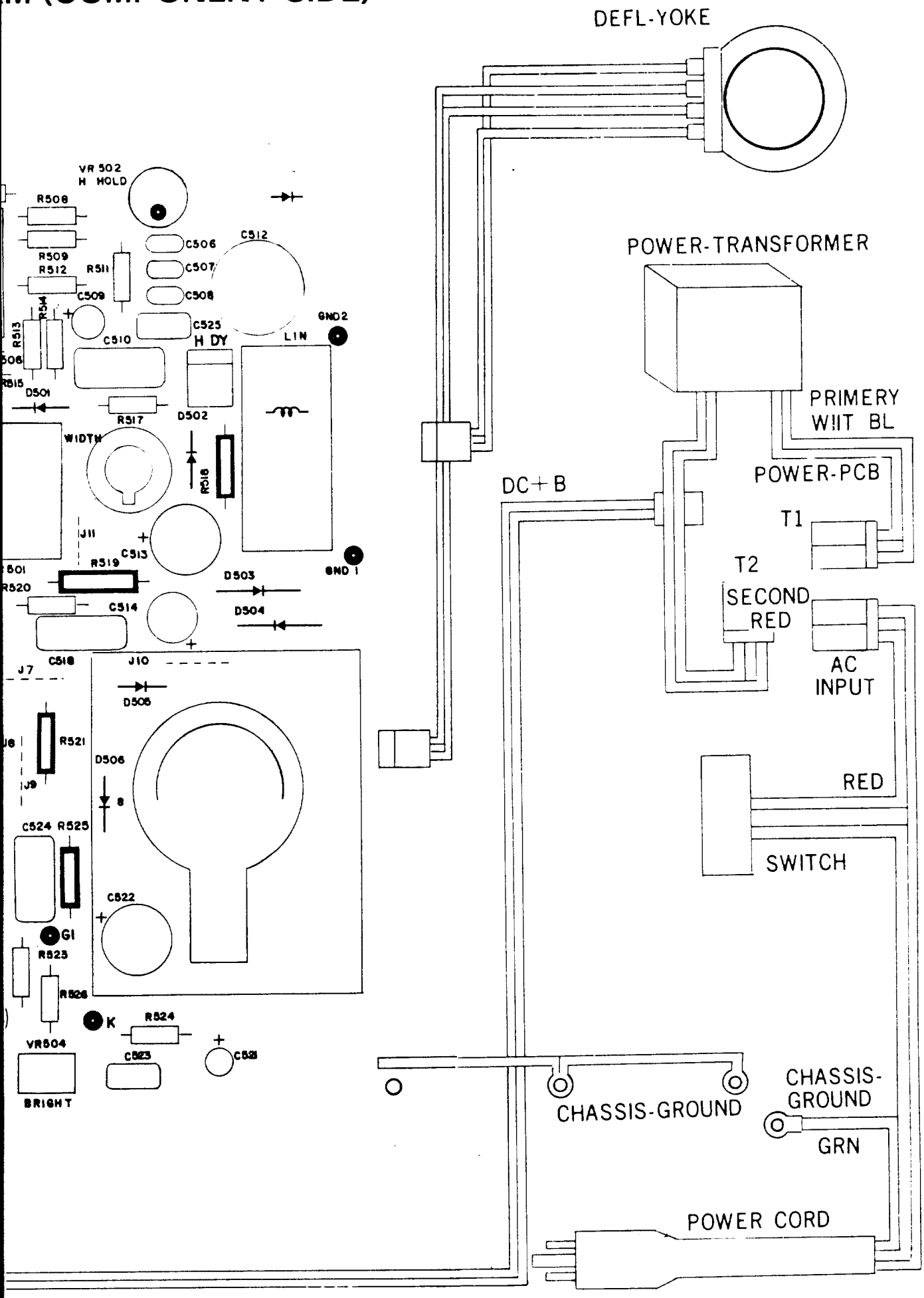
SCHEMATIC DIAGRAM



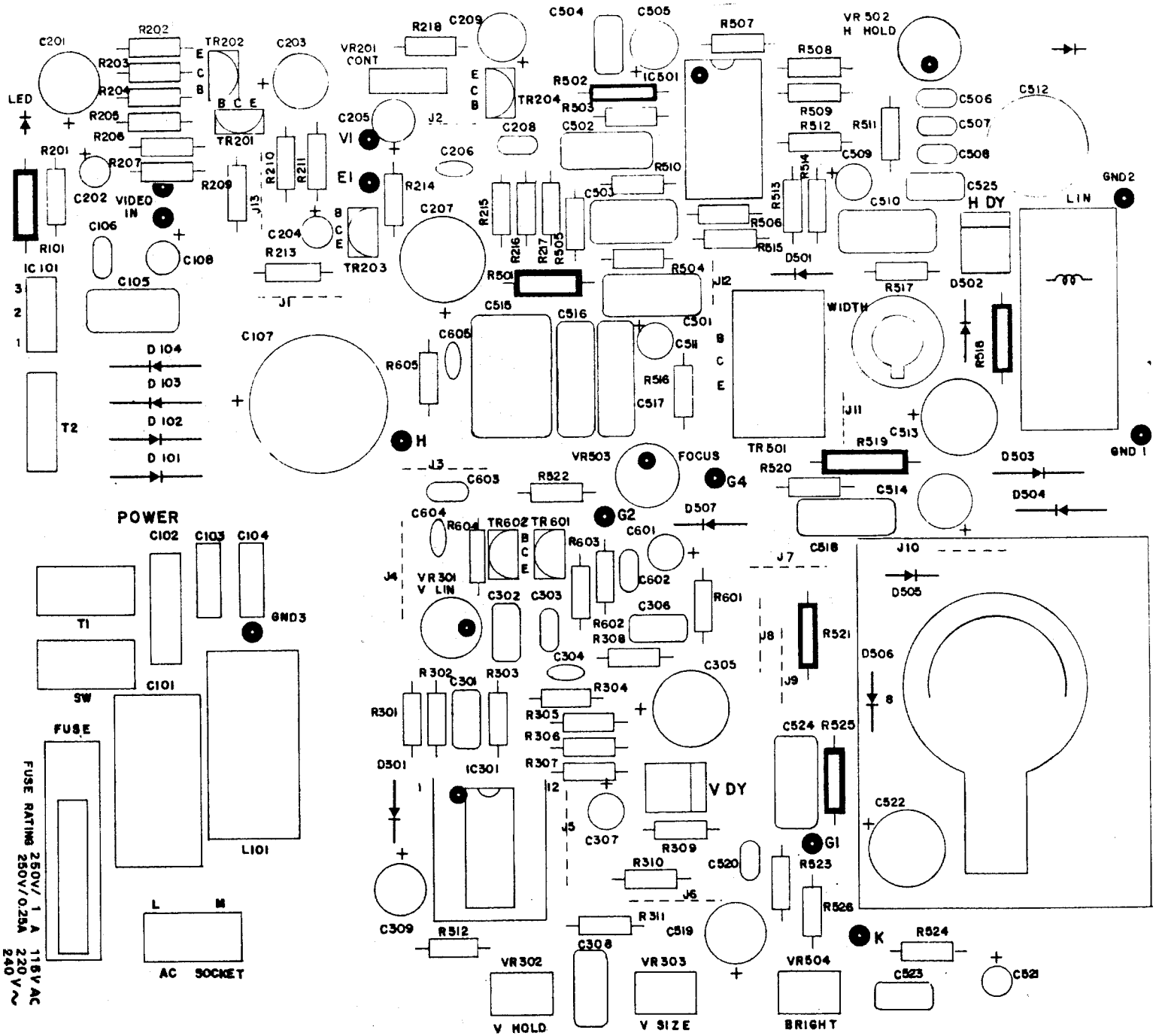
WIRING DIAGRAM (CON



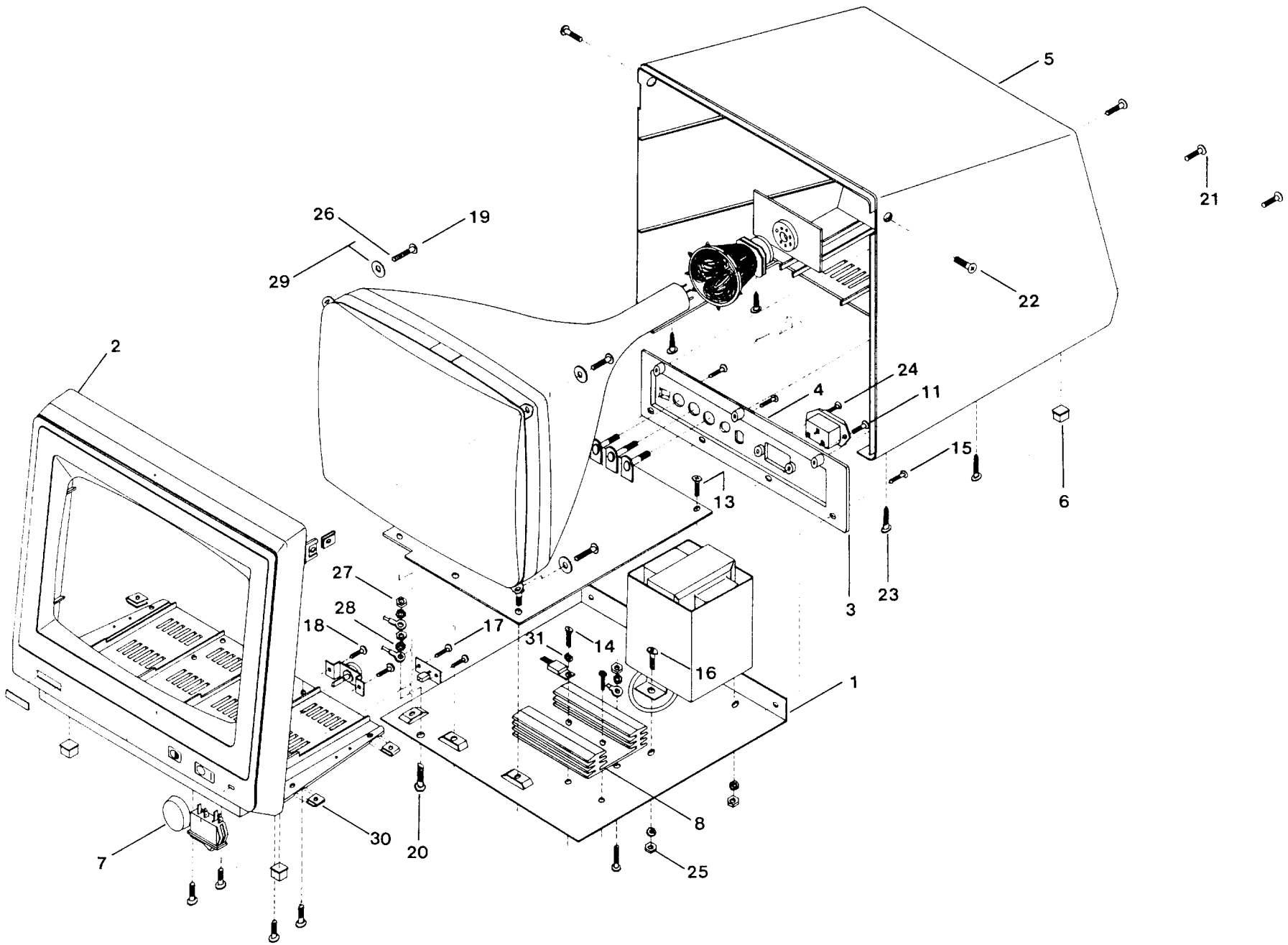
M (COMPONENT SIDE)



PCB COMPONENT LOCATION



EXPLODED VIEW



REPLACEMENT PARTS LIST

Location No.	Part No.	Description
	PICTURE TUBE	
	26-04-016	Picture Tube(Type : I2ZBY3IN)
	INTEGRATED CIRCUITS	
IC301	20-06-002	TDA 1170N
IC502	20-06-006	TDA 1180P
IC101	20-03-011	1.0A15V, 7815CT
	TRANSISTORS	
Q201	18-04-006	2SC1815
Q202	18-05-002	2SA1015
Q203	18-05-002	2SA1015
Q204	18-04-006	2SC1815
Q601	18-04-006	2SC1815
Q602	18-04-006	2SC1815
	DIODES	
D101	19-01-007	Diode,IN5402
D102	19-01-007	Diode,IN5402
D103	19-01-007	Diode,IN5402
D104	19-01-007	Diode,IN5402
D301	19-03-012	Diode,IN4150
D501	19-03-012	Diode,IN4150
D502	19-01-004	Diode,IN4004
D503	19-01-023	Diode,RGP 30G
D504	19-01-023	Diode,RGP 30G
D505	19-01-003	Diode,IN4003
D506	19-01-002	Diode,IN4002
D507	19-01-022	Diode,GI 818
	CAPACITORS	
C101	16-25-005	Capacitor-FXD M-Paper 0.47uF AC250V
C102	16-25-006	Capacitor-FXD M-Polypropylene 0.01uF AC 300V
C103	16-25-010	Capacitor-FXD M-Polyplopylene 4700pF AC 300V
C104	16-25-010	Capacitor-FXD M-Polyplopylene 4700pF AC 300V
C105	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C106	16-14-011	Capacitor-FXD Mylar 0.01uF 50V
C107	16-01-028	Capacitor-FXD Electrolytic 3300uF 35V(115V Only)
Alternate	16-01-030	Capacitor-FXD Electrolytic 6800uF 35V(230V Only)
C108	16-04-006	Capacitor-FXD Electrolytic 47uF 25V
C201	16-01-021	Capacitor-FXD Electrolytic 220uF 25V
C202	16-04-005	Capacitor-FXD Electrolytic 22uF 25V
C203	16-01-021	Capacitor-FXD Electrolytic 220uF 25V
C204	16-04-004	Capacitor-FXD Electrolytic 10uF 25V
C205	16-04-005	Capacitor-FXD Electrolytic 22uF 25V
C206	16-11-003	Capacitor-FXD Ceramic 330pF 50V
C207	16-01-022	Capacitor-FXD Electrolytic 470uF 25V
C208	16-04-004	Capacitor-FXD Mylar 0.033uF 50V
C209	16-04-004	Capacitor-FXD Electrolytic 10uF 25V
C301	16-14-005	Capacitor-FXD Mylar 0.1uF 100V
C302	16-14-005	Capacitor-FXD Mylar 0.1uF 100V
C303	16-14-001	Capacitor-FXD Mylar 0.0015uF 50V
C304	16-11-018	Capacitor-FXD Ceramic 100pF 100V
C305	16-01-011	Capacitor-FXD Electrolytic 1000uF 16V
C306	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C307	16-04-004	Capacitor-FXD Electrolytic 10uF 25V
C308	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C309	16-04-007	Capacitor-FXD Electrolytic 100uF 25V
C501	16-13-017	Capacitor-FXD Mylar 0.47uF 100V
C502	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C503	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C504	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C505	16-04-007	Capacitor-FXD Electrolytic 100uF 25V
C506	16-14-011	Capacitor-FXD Mylar 0.01uF 50V
C507	16-14-002	Capacitor-FXD Mylar 0.0039uF 50V
C508	16-14-011	Capacitor-FXD Mylar 0.01uF 50V
C509	16-04-003	Capacitor-FXD Electrolytic 4.7uF 25V
C510	16-13-017	Capacitor-FXD Mylar 0.47uF 100V
C511	16-04-003	Capacitor-FXD Electrolytic 4.7uF 25V
C512	16-09-003	Capacitor-FXD N-Polor 3.9uF 25V

C513	16-01-011	Capacitor-FXD Electrolytic 1000uF 16V
C514	16-04-007	Capacitor-FXD Electrolytic 100uF 25V
C515	16-15-010	Capacitor-FXD Polypropylene 0.047uF 630V
C516	16-15-025	Capacitor-FXD Polypropylene 0.033uF 400V
C517	16-15-025	Capacitor-FXD Polypropylene 0.033uF 400V
C518	16-15-008	Capacitor-FXD Polypropylene 0.01uF 630V
C519	16-01-038	Capacitor-FXD Electrolytic 10uF 160V
C520	16-14-001	Capacitor-FXD Mylar 0.0015uF 50V
C521	16-04-002	Capacitor-FXD Electrolytic 3.3uF 50V
C522	16-01-033	Capacitor-FXD Electrolytic 220uF 50V
C523	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C524	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C525	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C601	16-04-001	Capacitor-FXD Electrolytic 1uF 50V
C602	16-14-006	Capacitor-FXD Mylar 0.0056uF 100V
C603	16-14-006	Capacitor-FXD Mylar 0.0056uF 100V
C604	16-11-002	Capacitor-FXD Ceramic 100pF 100V
C605	16-11-001	Capacitor-FXD Ceramic 47pF 50V

RESISTORS

R101	14-06-102	Resistor-FXD Carbon 1KΩ 1/2W 5%
R201	14-04-221	Resistor-FXD Carbon 220Ω 1/4W 5%
R202	14-04-101	Resistor-FXD Carbon 100Ω 1/4W 5%
R203	14-04-681	Resistor-FXD Carbon 680Ω 1/4W 5%
R204	14-04-153	Resistor-FXD Carbon 15KΩ 1/4W 5%
R205	14-04-101	Resistor-FXD Carbon 100Ω 1/4W 5%
R206	14-04-562	Resistor-FXD Carbon 5.6KΩ 1/4W 5%
R207	14-04-750	Resistor-FXD Carbon 75Ω 1/4W 5%
R209	14-04-221	Resistor-FXD Carbon 220Ω 1/4W 5%
R210	14-04-331	Resistor-FXD Carbon 330Ω 1/4W 5%
R211	14-04-224	Resistor-FXD Carbon 220KΩ 1/4W 5%
R213	14-04-221	Resistor-FXD Carbon 220Ω 1/4W 5%
R214	14-04-102	Resistor-FXD Carbon 1KΩ 1/4W 5%
R215	14-04-274	Resistor-FXD Carbon 270KΩ 1/4W 5%
R216	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R217	14-04-302	Resistor-FXD Carbon 3KΩ 1/4W 5%
R218	14-04-151	Resistor-FXD Carbon 150Ω 1/4W 5%
R301	14-04-393	Resistor-FXD Carbon 39KΩ 1/4W 5%
R302	14-04-474	Resistor-FXD Carbon 470KΩ 1/4W 5%
R303	14-04-824	Resistor-FXD Carbon 820KΩ 1/4W 5%
R304	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R305	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R306	14-04-563	Resistor-FXD Carbon 56KΩ 1/4W 5%
R307	14-04-563	Resistor-FXD Carbon 56KΩ 1/4W 5%
R308	14-04-033	Resistor-FXD Carbon 3.3Ω 1/4W 5%
R309	14-04-018	Resistor-FXD Carbon 1.8Ω 1/4W 5%
R310	14-04-392	Resistor-FXD Carbon 3.9KΩ 1/4W 5%
R311	14-04-124	Resistor-FXD Carbon 120KΩ 1/4W 5%
R312	14-04-823	Resistor-FXD Carbon 82KΩ 1/4W 5%
R501	14-09-220	Resistor-FXD Metal Oxide 22Ω 1W 5%
R502	14-10-101	Resistor-FXD Metal Oxide 100Ω 2W 5%
R503	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R504	14-04-155	Resistor-FXD Carbon 2.2MΩ 1/4W 5%
R505	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R506	14-04-502	Resistor-FXD Carbon 5KΩ 1/4W 5%
R507	14-04-223	Resistor-FXD Carbon 22KΩ 1/4W 5%
R508	14-04-123	Resistor-FXD Carbon 12KΩ 1/4W 5%
R509	14-04-823	Resistor-FXD Carbon 82KΩ 1/4W 5%
R511	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R512	14-04-122	Resistor-FXD Carbon 1.2KΩ 1/4W 5%
R513	14-04-824	Resistor-FXD Carbon 820KΩ 1/4W 5%
R514	14-04-332	Resistor-FXD Carbon 3.3KΩ 1/4W 5%
R515	14-06-473	Resistor-FXD Carbon 47KΩ 1/2W 5%
R516	14-04-562	Resistor-FXD Carbon 5.6KΩ 1/4W 5%
R517	14-04-033	Resistor-FXD Carbon 33Ω 1/4W 5%
R518	14-06-471	Resistor-FXD Carbon 470Ω 1/2W 5%
R519	14-09-005	Resistor-FXD Metal Oxide 0.5Ω 1W 5%
R520	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R521	14-06-101	Resistor-FXD Carbon 100Ω 1/2W 5%
R522	14-04-154	Resistor-FXD Carbon 150KΩ 1/4W 5%
R523	14-04-473	Resistor-FXD Carbon 47KΩ 1/4W 5%
R524	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R525	14-06-682	Resistor-FXD Carbon 6.8KΩ 1/2W 5%
R526	14-04-563	Resistor-FXD Carbon 56KΩ 1/4W 5%
R601	14-04-222	Resistor-FXD Carbon 2.2KΩ 1/4W 5%
R602	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R603	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R604	14-04-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R605	14-04-563	Resistor-FXD Carbon 56KΩ 1/4W 5%

CONTROLS

VR301	15-05-008	V-Trimer W/Shaft 220KΩ B 0.15W 25%
VR302	15-03-003	H-Trimer W/Shaft 100KΩ B 0.2W 25%

VR303	15-03-003	H-Trimer W/Shaft 100KΩ B 0.2W 25%
VR502	15-05-005	V-Trimer W/Shaft 22KΩ B 0.15W 25%
VR503	15-05-010	V-Trimer W/Shaft 2.2MΩ B 0.15W 25%
VR504	15-03-003	H-Trimer W/Shaft 100KΩ B 0.2W 25%

COILS

L501	17-04-004	Coil Horizontal Width 16—36uH
L502	17-05-004	Coil Horizontal Linearity 10—35uH
L/F101	17-08-004	Coil Line Filter 15.5uH 120mm

FLYBACK TRANSFOMER & DEFELECTION YOKE

	17-03-003	Defelection Yoke DMK-1294 BL
T501	17-02-021	Flyback Transformer FMC-1245 CL (S)

TRANSFORMERS & FUSE & FUSE CLIP

17-01-025	Power Transformer (451-01-016)	(115V)
17-01-026	Power Transformer (451-01-017)	(230V)
23-01-018	Fuse 0.75A/125V	(115V Only)
23-01-019	Fuse 0.75A/250V	(230V Only)
23-04-007	Clip Fuse 20mm	

AC CORDS & TERMINALS & WIRINGS

21-07-004	Power Cord SVT 3/18 AWG 6F Black	(115V Only)
21-07-005	Power Cord SVT 3/18 AWG 6F Black	(230V Only)
10-11-001	HDR, Lock, 3.96, 2P Black	(V-DY Base)
10-11-002	HDR, Lock, 3.96, 2P White	(H-DY Base)
21-05-022	Wire, Connector Housing, 3P 108mm	(IC101 Connector)
21-06-005	Wire, Ring Terminal, 58mm	(GND)
21-06-006	Wire, Ring Terminal, 105mm	(GND)
22-04-032	LED PCB	
19-06-008	LED (SLB-25MG)	
21-02-027	Wire manut, Strended AWM1007 195mm Red	(Led Wire)
22-02-028	Wire manut, Strended AWM1007 195mm Black	(Led Wire)
21-01-035	Wire Bus 52mm	(13PCS)

BU 806 ASS'Y

00-06-013	BU 806 Ass'y Heat Sink
18-07-013	BU 806 TR NPN
06-25-006	Heat Sink for BU806. 23.2×13.8×50
24-42-001	Washer Gear Outside 3.2×6.5×0.45W
24-01-003	M-SCR Pan Head M3×8W

PHONE JACK ASS'Y

00-07-002	Phone Jack Ass'y Heat sink
10-08-004	RCA Type Phone Jack P-155P-128
21-01-037	Wire, Coaxil Cable UL1365 AWG30 Black
12-21-002	Shrinkable Tube 4ϕ ×13mm

CONTRAST ASS'Y

00-05-002	Contrast Ass'y
15-05-003	V-Trimer W/Shaft 500Ω B 0.15W 25%
06-22-006	BRKT, CONT
21-01-005	Wire, Strended AWM1007 Yellow
21-01-008	Wire, Strended AWM1007 Violet
21-01-009	Wire, Strended AWM1007 Green

POWER SWITCH ASS'Y

00-04-010	Power Switch Ass'y
23-02-004	Rocket Switch (SDW-112-13-2)
21-05-097	2 Pin Housing Connecter
21-01-016	Wire Strended AWM1015
12-21-003	Shrinkable Tube 5ϕ ×13mm

INLET SOCKET ASS'Y

00-09-007	Ass'y AC Recept
10-08-003	Socket AC Receptable 3505
21-05-036	Wire Connector Housing, 2P, GR White, Black 93mm
12-21-003	Tube, Shrinkable 5ϕ

MISCELLANEOUS

22-04-024	P.C. Board Blank
10-08-004	Phone Jack (P-155P-128)
10-07-007	Fastener 93mm

13-15-083	Label, Product STD.	(115V Only)
13-15-084	Label, Product STD.	(230V Only)
07-21-002	Magnet Square, Ferrite 10 Gauss etc.	
13-11-043	C/T Box	
13-13-012	Styroform, Left	
13-13-013	Styroform, Right	
13-17-002	Vinyl Bag	
13-16-010	Manual	
06-26-003	Logo	
10-11-029	Bead Pin (8000 PCS)	(S/W, AC Input)
13-15-047	Label, H-Voltage Warning 60×20	

MECHANICAL PARTS

06-20-003	Chassis Bottom	1
10-05-009	Front Bezel	2
10-05-013	Back Plate	3
10-05-017	Strein Relief	4
10-05-010	Rear Cover	5
10-09-002	Rubber Foot	6
10-05-015	Knob Contrast	7
06-25-023	Heatsink Regulator	8
06-25-011	IC1170N Heatsink	9
00-06-013	BU806 Heatsink Ass'y	10
10-08-003	Inlet Socket 3505	11
24-26-037	M-Screw Pan Head W/Washer, C, M3×8W	12
24-01-003	M-Screw Pan Head M3×8W	13
24-26-013	T-Screw C/S Head M3×8W	14
24-26-039	M-Screw Pan Head W/Washer, C, M4×8W	15
24-04-004	P-Screw Pan Head #6×8W	16
24-04-005	P-Screw Pan Head #6×10W	17
24-04-016	P-Screw Pan Head #8×18W	18
24-03-003	M-Screw Hex Head M4×15W	19
24-26-029	P-Screw Pan Head Ivory #4×12	20
24-26-056	T-Screw Pan Head Ivory #8×15	21
24-05-003	T-Screw Pan Head White 8×15	22
26-26-012	P-Screw C/S Head Black #4×12	23
24-31-005	Nut Hex White M4×0.7P	24
10-09-007	Rubber Washer White 5×14×2	25
24-31-005	Nut Hex White M4×0.7P	26
24-42-007	Washer Gear Out Side White 4.8×9.5×0.5	27
24-41-017	Flat Washer White 5.3×16×1.2	28
24-32-002	Nut Tinnetman C11400-022	29
24-42-001	Washer Gear Out Side White 3.2×6.5×0.45	30

CRT SOCKET ASS'Y

10-08-016	Socket CRT 20 ϕ 6 Pin
22-04-039	P.C Board FR-1, Socket 1.6t

TRANSISTORS

Q401	18-04-006	2SC1815
Q402	18-04-015	KSC 2310Y

WIRINGS

GI	21-01-002	Wire Strended AWM1007 220mm Brown
K	21-01-003	Wire Strended AWM1007 190mm Red
G4	21-01-008	Wire Strended AWM1015 240mm Violet
H	21-01-004	Wire Strended AWM1007 220mm Yellow
GND	21-01-014	Wire Strended AWM1015 240mm Black
G2	21-01-007	Wire Strended AWM1015 165mm Blue
V	21-01-037	Coaxial Cable AWM1365 165mm Black

CAPACITORS

C401	16-11-003	Capacitor-FXD. Ceramic 330pF 50V
C402	16-01-033	Capacitor-FXD. Electrolytic 220uF 50V
C403	16-01-007	Capacitor-Fxd. Electrolytic 100uF 25V

RESISTORS

R402	14-04-682	Resistor-FXD. Carbon 6.8KΩ 1/4W 5%
R403	14-10-122	Resistor-FXD. Metal Oxide 1.2KΩ 2W 5%
R404	14-04-101	Resistor-FXD. Carbon 101Ω 1/4W 5%
R405	14-04-680	Resistor-FXD. Carbon 68Ω 1/4W 5%
R406	14-04-122	Resistor-FXD. Carbon 1.2KΩ 1/4W 5%
R407	14-04-102	Resistor-FXD. Carbon 1KΩ 1/4W 5%
R408	14-04-102	Resistor-FXD. Carbon 1KΩ 1/4W 5%
R409	14-09-390	Resistor-FXD. Metal Oxide 39Ω 1W 5%
R410	14-04-563	Resistor-FXD. Carbon 56KΩ 1/4W 5%

R411	14-04-222	Resistor-FXD. Carbon 2.2KΩ 1/4W 5%
R412	14-04-820	Resistor-FXD. Carbon 82Ω 1/4W 5%

LAMP&-SPARK-GAPS

E401	16-24-003	Spark-Gap 1KV −15% /+50%
E402	16-24-003	Spark-Gap 1KV −15% /+50%
E403	16-24-004	Neon Lamp 100V
E404	16-24-003	Spark-Gap 1KV −15% /+50%